

**Climate Action Status Report**  
**(Environment Article § 2-1305(c))**

**A Report to the Governor**  
**and**  
**the Maryland Commission on Climate Change**

**MSAR #14367**

**Maryland Department of Transportation**  
**December 2023**

2023



# CLIMATE ACTION STATUS REPORT

Required under the Maryland  
Commission on Climate Change  
Act [§2-1305] MSAR 14367



# OVERVIEW

## MDOT APPROACH

The Maryland Department of Transportation (MDOT) is a member of the Maryland Commission on Climate Change (MCCC) and works with other state agencies, elected officials, and experts who advise the Governor and General Assembly “on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change.”

The Maryland Greenhouse Gas Reduction Act (GGRA) required the Maryland Department of Environment (MDE) to submit a plan that reduces statewide greenhouse gas (GHG) emissions by 40% from 2006 levels by 2030 (“40 by 30”). This plan was prepared in 2021. MDOT has worked in coordination with MDE, other agencies, and partners to develop and implement strategies for the transportation sector to support achieving the goals of the GGRA.

The Climate Solutions Now Act of 2022 (CSNA) updated these goals to reduce GHG emissions statewide by 60% from 2006 levels by 2031 (“60 by 31”) and achieve a net-zero carbon emissions goal by 2045. MDE is required to publish a revised plan to achieve this goal

by December 2023. The CSNA replaces the GGRA, however revised and additional GHG reduction strategies are not yet published, therefore, this annual status report provides the final update using the strategies established in the GGRA Plan. MDOT is also updating the Maryland Transportation Plan 2050, which is still in draft, therefore this status report primarily uses analysis from the current 2040 plan.

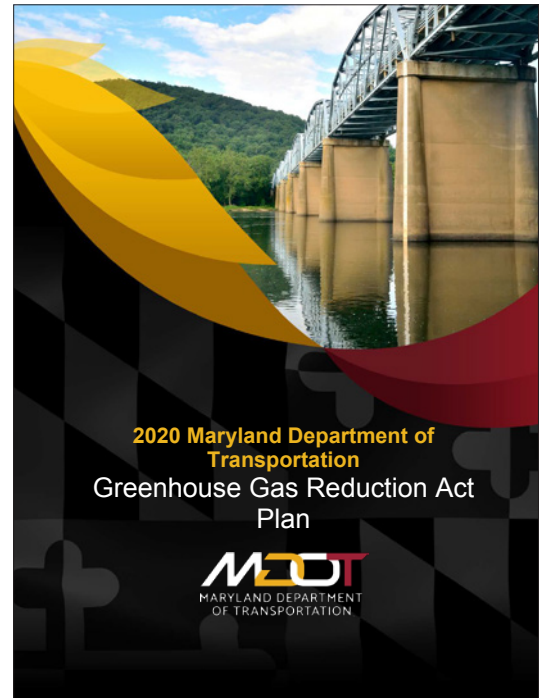
MDOT’s annual reports provide a review of recent, ongoing, and planned activities that support GHG reduction efforts across three different tiers of implementation—policy, programs, and data. This Climate Action Status Report draws from four main sources of planning, performance, and budgetary/financial reporting systems:

- (1) The 2040 Maryland Transportation Plan ([MTP](#)), as well as the draft 2050 MTP (January 2024)
- (2) The Consolidated Transportation Program ([CTP](#))
- (3) The Annual Attainment Report on Transportation System Performance ([AR](#))
- (4) The MDOT GGRA Plan (Appendix J to the [2030 GGRA Plan](#))



Direct input from staff across MDOT’s five modal administrations and one Authority informs the insights from these planning, performance, and budgetary reporting systems. This report presents a mix of information reflecting projects, programs, and initiatives from fiscal year (FY) 2023, as well as progress towards policy scenarios outlined in the [2020 MDOT GGRA Plan](#).

The GGRA Plan lays out strategies—both funded and unfunded—categorized by means of reducing emissions through adoption of transportation technologies, reducing vehicle miles traveled (VMT), improving system efficiency, mitigating congestion, infrastructure design opportunities for clean energy use, and ensuring that transportation infrastructure is resilient to impacts of climate change. The figure below shows the scenario construct of the MDOT GGRA plan. While most of the strategies are addressed under the reference case (fuel economy standards and electric vehicles (EVs) projections), MDOT’s CTP and the Metropolitan Planning Organization (MPO) plans and programs cover the funded strategies that are discussed throughout the report. Throughout this update, the relevant GHG reduction strategies are indexed by policy scenario and strategy number listed in the 2020 MDOT GGRA Plan. [Appendix B](#) provides a reference to each GHG mitigation strategy referenced in this document, with strategy descriptions and associated assumptions.



REFERENCE CASE	POLICY SCENARIO 1 "On-the-Books"	POLICY SCENARIO 2 "Emerging & Innovative"
<ul style="list-style-type: none"> <li>• Current VMT growth trend through 2030</li> <li>• Existing federal GHG emission standards (light-duty vehicles and medium-/heavy-duty trucks)</li> <li>• EV market share consistent with meeting ZEV Mandate</li> </ul>	<ul style="list-style-type: none"> <li>• Funded and committed transportation projects, programs, and initiatives through 2023</li> <li>• MPO plans and programs, VMT growth, lead-by-example strategies, and other federally funded strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded and accelerated traditional and emerging MDOT programs (unfunded), enhanced ZEV market share with a regional clean low-carbon fuel standard</li> <li>• New and innovative transportation strategies, partnerships, and technologies</li> </ul>

Climate change constitutes a significant risk to the safety, equity, and sustainability of the transportation system and the people and businesses it serves. This Status Report is MDOT’s annual review and analysis of the past FY’s strategies and actions toward climate change, resilience, and adaptation, as well as reduction and mitigation of GHG emissions. This year’s report is being developed as federal and state mandates in late 2022 and early 2023, including the CSNA, have accelerated the push to support Maryland’s climate change priorities. The analysis and reporting set the stage for future strategies and actions. The report is organized across the following focus areas: **Transportation Technology, VMT Reduction, Congestion Mitigation, Infrastructure Design and Climate Change Resilience and Adaptation.**



## Transportation Technology

MDOT has facilitated the development of strategies to accelerate the adoption of low-carbon and emission reduction technologies for vehicle infrastructure. MDOT is leading various initiatives including the Maryland Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC), implementing the Connected and Automated Vehicle (CAV) Strategic Framework, and providing regulatory and policy support to facilitate the adoption of these low-carbon and emission reduction technologies to help achieve the GGRA targets. This includes leveraging National Electric Vehicle Infrastructure (NEVI) Formula Funds and Charging and Fueling Infrastructure (CFI) Funds.

## VMT Reduction

These are policies and strategies that support a shift to less carbon intensive modes or that promote trip consolidation, carpooling, and reduced vehicle use. Motor Vehicle Administration (MVA) has implemented alternative service delivery mechanisms, including web-based transactions to reduce the number of in-person visits required at their locations. Other strategies include transit oriented development (TOD) and transportation demand management (TDM) programs, such as Commuter Choice Maryland, that reduce trips through telework and compressed schedules; promote transit, ridesharing, and active commuting; and connect employers and commuters to transportation options and incentives ([PS 1.1](#), [PS 1.7](#)).



## Congestion Mitigation

Congestion mitigation programs and projects improve passenger and freight reliability, efficiency, air quality, and enhances the quality of life for Marylanders. MDOT's commitment to reducing congestion through various initiatives—including the deployment of State Highway Administration's (SHA) Transportation Systems Management and Operations (TSMO) strategies - improve the safety, security and reliability of our transportation network. Other initiatives, such as the Coordinated Highways Action Response Team (CHART), focus on optimizing the transportation system by improving incident response times and providing traveler information (Maryland 511) and 24/7 traffic monitoring and management to improve efficiency ([PS 1.2](#)). TDM programs that encourage alternatives to single occupant vehicle (SOV) use also reduce congestion on roadways ([PS 1.7](#)).

## Infrastructure Design

MDOT continues to take steps to ensure that its assets and facilities are designed to be sustainable and resilient to the impacts of climate change while also supporting the goal of reduced GHG emissions throughout its transportation system. This includes projects that focus on renewable energy systems, energy efficiency upgrades, long-term resilience of transportation assets and infrastructure, and that incorporate evolving needs and changing technology.



## Climate Change Resilience and Adaptation

Maryland has been a leader in integrating climate change resilience and adaptation into agency processes by identifying system vulnerabilities, investing in resilience projects and activities, coordinating with partners and stakeholders on responding to the challenges, and communicating the potential risks and benefits of action for transportation system users.

# INTRODUCTION

## MDOT MISSION, GOALS, AND INVESTMENTS

The MDOT mission emphasizes the importance of a customer-driven transportation system:



### MISSION STATEMENT

*The Maryland Department of Transportation is a customer-driven leader that delivers safe, sustainable, intelligent, exceptional, and inclusive transportation solutions in order to connect our customers to life's opportunities.*



There are four goals supporting MDOT's mission as proposed in the draft 2050 MTP:

1. Enhance Safety and Security
2. Deliver System Quality
3. Serving Communities and Support the Economy
4. Promote Environmental Stewardship

The draft 2050 MTP also includes "Guiding Principles," which are concepts that MDOT incorporates into all its activities as the Department executes its transportation system goals:

1. **Equity:** Integrate equity considerations in all aspects of transportation planning, programming, and operational processes.
2. **Preservation:** Preserve the condition of the existing transportation system assets to provide safe and efficient movement.
3. **Resilience:** Improve the transportation system's ability to provide reliable service throughout natural weather events and man-made threats.
4. **Modernization:** Transform the transportation system by using proven technological improvements and exploring innovative new ideas.
5. **Experience:** Improve the experience of all transportation system users.

The draft 2050 MTP goals and guiding principles also help advance MDOT's approach to adapt to and combat climate change, including:

- Equitable delivery of the state's transportation infrastructure program that conserves and enhances Maryland's natural, historic, and cultural resources,
- System preservation, safety and security, and quality of service goals that drive MDOT's progress towards improving resilience and transitioning to a more efficient transportation system, and
- Commitment to multimodal accessibility and mobility for all transportation system users, helping to mitigate congestion and shift travel to less emission-intensive modes.

### The draft 2050 MTP vision is:

*To provide safe, reliable, accessible, equitable, and sustainable transportation options across the State.*

# PLANNING TO COMBAT CLIMATE CHANGE

MDOT has several climate-focused plans in development as the 2009 GGRA was replaced by the CSNA in 2022. MDOT takes a “family of plans” approach to various policy, programmatic, and multimodal aspects of planning together to further the agency mission and goals. The purpose of these plans is to develop an agency-level strategy to identify needs, develop approaches, and prioritize investments and solutions to meet the agency, program, and plan goals and objectives.

**Mitigation:** The CSNA Plan will build on the analysis performed as part of [Maryland's Climate Pathway](#) report, and is required to be finalized by December 2023. The CSNA Plan will guide decarbonization efforts statewide. The CSNA set an even more ambitious GHG emission reduction goal than that of the GGRA – requiring a 60% reduction (from 2006 level) by 2031 and net-zero emissions by 2045. The CSNA plan will document GHG mitigation strategies and programs to be employed economy-wide across several sectors, including transportation. The Carbon Reduction Strategy (CRS) is currently being developed in accordance with federal requirements and guidance of the Carbon Reduction Program (CRP) created by the Infrastructure Investment and Jobs Act (IIJA) and will identify projects and strategies to reduce transportation emissions in the state.

**Adaptation/Resilience:** The Transportation Resilience Improvement Plan (TRIP) is being developed to address surface transportation system resilience to current and future weather events and natural disasters. It is being prepared in accordance with the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) program established under IIJA.

An overall MDOT Climate Action Plan is currently under development to incorporate both GHG reduction efforts and resilience improvement efforts in one plan. The Climate Action Plan will incorporate relevant statewide programs and activities, and synergies between ongoing MDOT climate resilience efforts in existing programs and plans will be noted. The Climate Action Plan will also serve as a central repository for policy, guidance, information, forums, and documenting achievements by MDOT to reduce GHG emissions and improve transportation system resilience.

The MTP is also being [updated](#), and will guide the state’s vision, policy and investment priorities for the next 20 years to deliver concrete results towards a safe, reliable, and world-class transportation system for Maryland. One of the draft guiding principles is to “improve the transportation system’s ability to provide reliable service throughout natural weather events and man-made threats.”

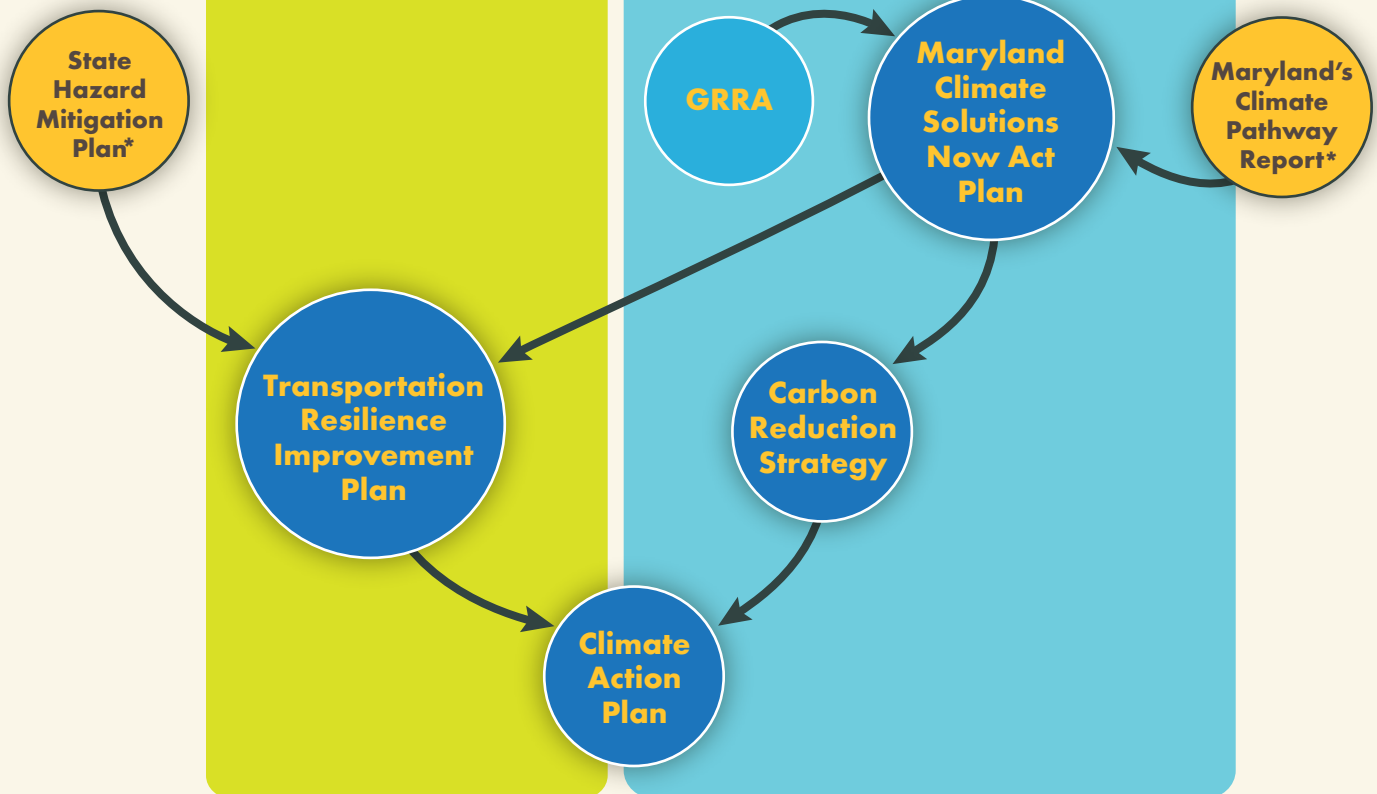


# MDOT's Family of Plans

2050 MTP (January 2024), MDOT CTP, MDOT AR, MDOT State Freight Plan, MDOT State Rail Plan, MDOT Strategic Asset Management Plan, MDOT Bicycle & Pedestrian Master Plan, MDOT NEVI Plan

## RESILIENCE

## MITIGATION



\*State Agency Partners' Plans.

These plans allow MDOT to make informed decisions about program implementation and access complementing funding programs with variable requirements and eligibilities. Looking at the family of plans allows MDOT to prioritize and undertake projects that provide both decarbonization and resilience benefits and support combating climate change. MDOT coordinates with other state agencies including MDE, the Maryland Department of Planning (MDP), the Maryland Department of Emergency Management (MDEM), and others to be consistent with statewide plans that address decarbonization, climate change, extreme weather, and natural disasters in the state.



## PLAN



### **2050 Maryland Transportation Plan (January 2024)**

The MTP establishes a 20-year vision for multimodal transportation in Maryland that outlines the states' transportation policies and priorities and helps guide statewide investment decisions for all modes of transportation.

## INVEST



### **Maryland Consolidated Transportation Program (FY 2023-2028)**

The CTP is MDOT's fiscally constrained six-year capital budget for all State transportation projects. MDOT works with residents, businesses, local jurisdictions and local and state elected officials to include projects in the CTP.

## EVALUATE



### **2023 Annual Attainment Report On Transportation System Performance**

The annual Attainment Report (AR) provides an overview of the transportation system, investment strategies, and mobility and accessibility outcomes. MDOT assesses progress toward achieving its overarching goals by aligning performance measures and data with each MTP goal area and objective.

MDOT integrates various planning, management, and implementation efforts to combat climate change and advance technology for a better transportation system. The MDOT Office of Climate Change Resilience and Adaptation (OCCRA), housed within the Environment and Sustainable Transportation Program in the MDOT Secretary's Office (TSO), is working with the MDOT modal administrations to incorporate climate change mitigation, resilience, adaptation and risk management into planning, project development, asset management, maintenance, design, construction, and operations. All of these documents work together to guide MDOT's priorities and future investments. Integrated long-range and strategic plans, such as the MTP, Statewide Freight Plan, the recently updated Statewide Rail Plan, Strategic Highway Safety Plan (SHSP), Bike and Pedestrian Master Plan, and the GGRA Plan, among others, create an opportunity for MDOT to connect statewide goals with its overall mission. As these and other plans are updated, they will be incorporated into future reporting.

# THE STATE OF GHG EMISSIONS



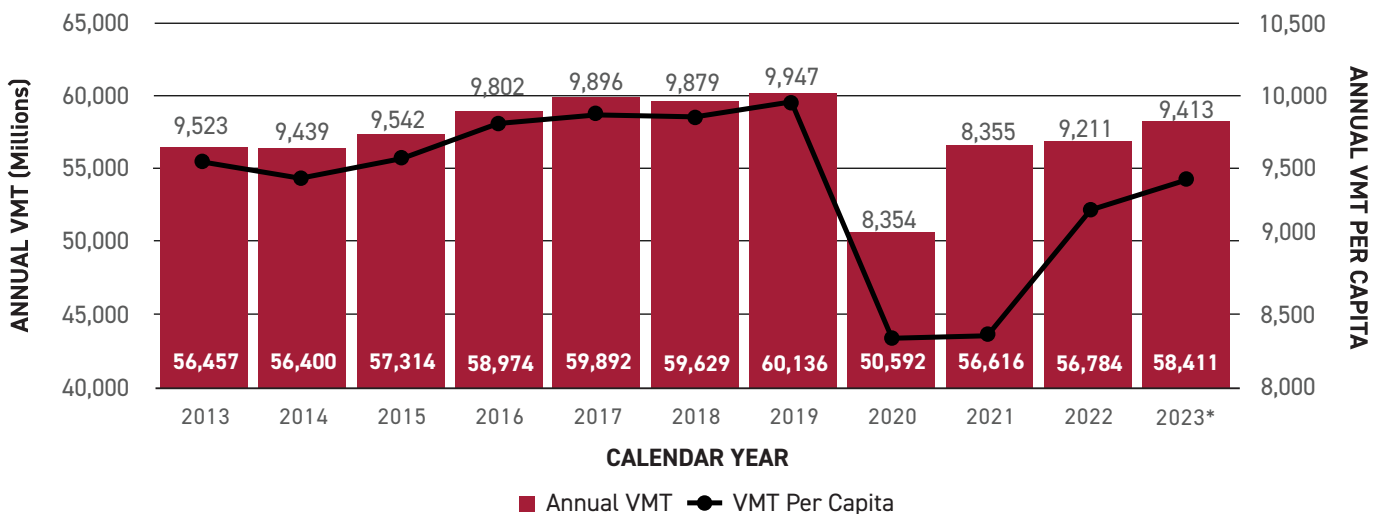
## GHG EMISSIONS FROM TRANSPORTATION

MDOT is producing an annual GHG inventory for on-road vehicles in conjunction with the AR. In addition, the National Emissions Inventory (NEI) is developed by the US Environmental Protection Agency (EPA) through consultation with state agencies every three years. The current inventory, developed for 2020, shows transportation as the largest contributor of GHG emissions followed by electricity use and Residential/Commercial/Industrial (RCI) fuel use. The transportation sector accounts for approximately 34% of the total GHG inventory with on-road gasoline and diesel vehicles representing 82% of the total. Off-road (aviation, marine, rail) represents the remaining share of the transportation sector. GHG emissions from on-road transportation is primarily a product of three trends: VMT, the efficiency (miles per gallon) of the fleet, and the GHG intensity of energy used in vehicles. The GHG on-road emissions have decreased every year between 2006 and 2019, with significant reduction in 2020 related to the COVID pandemic. 2021, 2022, and the 2023 estimate are below 2019 levels as post-pandemic travel recovers.

## VEHICLE MILES TRAVELED

The movement of people and goods is measured through VMT. The 2023 AR, based on feedback from the Governor’s Attainment Report Advisory Committee (ARAC), will now include VMT per capita as a performance measure and include a target. The figure below shows the total and per capita VMT trends. Since 2013, VMT rose and then stabilized from 2017-2019. Pandemic restrictions and return-to-work outcomes spurred a sharp drop, with historic lows in 2020 (16% decrease in VMT compared to 2019); and then a 12% increase in VMT in 2021 compared to 2020. VMT in 2022 stayed steady with a slight increase (.3%) compared to 2021. For 2023, projected VMT was still down by nearly 3% compared to pre-pandemic levels in 2019. While VMT per capita dropped in 2020 and 2021 due to the pandemic, it has been increasing in 2022 and 2023. However, VMT per capita is not back to pre-pandemic levels in 2018 and 2019.

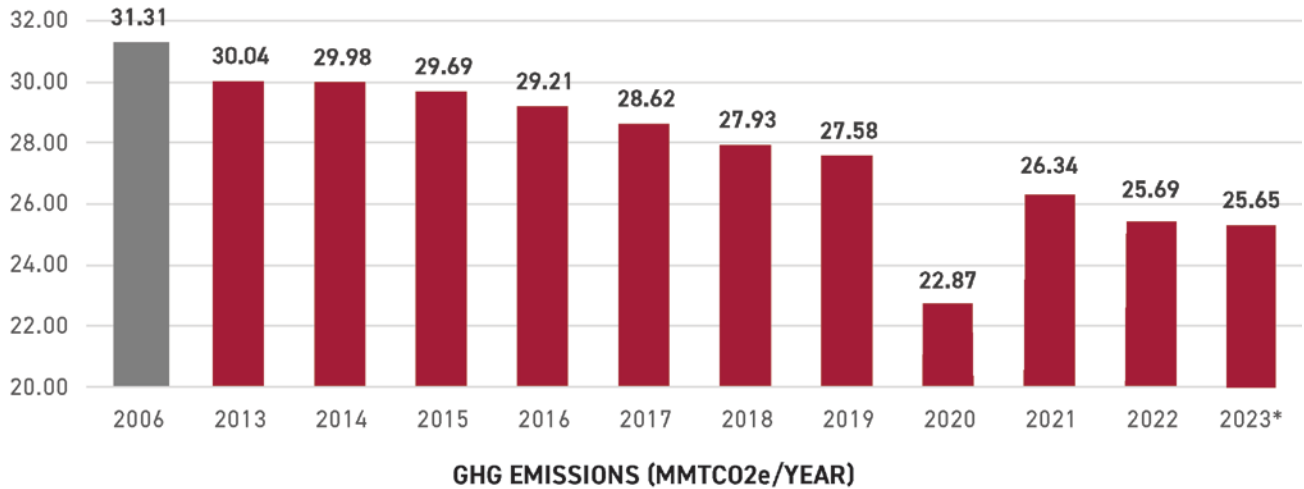
**Annual Total VMT and VMT Per Capita**



\*2023 data is estimated.



## Total GHG Emissions from On-Road Sources



\*2023 data is estimated. \*\*Recent adjustments for EVs updated the 2020-2023 totals.

## ON-ROAD VEHICLE FLEET

Efficiency of the on-road vehicle fleet continues to improve, as older vehicles are replaced with newer vehicles that meet more stringent federal GHG emission standards. As of June 30, 2023, 23,542 new EVs have been registered over the past year, bringing the total number of EVs registered in Maryland to 75,861, an increase of 45% from June 30, 2022. EVs now make up more than 1.5% of all vehicles registered in the State. The combination of federal GHG emissions standards and an increasing proportion of EVs in the statewide fleet resulted in a decline in GHG emissions from on-road transportation during the last decade. There were significant emissions decreases in 2020 driven by reduced travel during the earlier period of the COVID-19 pandemic.

Between 2020 and 2023, GHG emissions from on-road sources increased by almost 12%, shown above. This can be attributed largely to exceptional changes in driving behavior during the COVID-19 pandemic. Between 2006 and 2023, on-road GHG emissions have decreased by more than 18%. Longer-term changes to travel behavior as a result of the pandemic, such as teleworking, shifts in transit demand, and increased freight activity, are still being studied and considered. However, these behavioral and cultural changes are still evolving, which will have some impact on selection and implementation of decarbonization pathways and mitigation strategies that will need to be implemented to respond to such changes.

# MDOT's CLIMATE CHANGE COMMITMENT

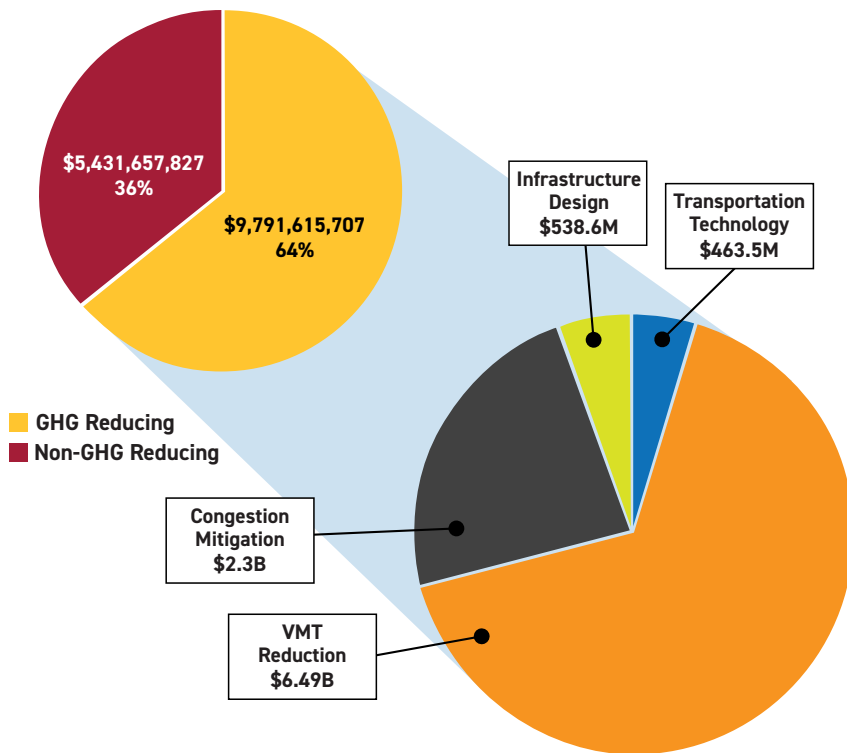
As a means to understanding and demonstrating the overall commitment to reducing GHG emissions and minimizing climate change impacts, MDOT continues to track the total share of CTP funding dedicated to projects that will help Maryland meet its climate change goals.

Within the FY 2023–2028 CTP, 64% (approximately \$9.8 billion) of Maryland's major capital program are investments that will potentially reduce GHG emissions through 2030 and beyond. This share excludes spending on minor capital programs, such as system preservation and maintenance activities, which are essential to maintain the state's transportation system to meet its performance goals. The Maryland Transportation Authority's (MDTA) capital projects are included in MDOT's six-year capital program submitted with the Governor's budget to the legislature and in this share of GHG emissions-reducing investments. However, MDTA is a separate revenue-generating agency from MDOT and does not receive any funding from the Transportation Trust Fund. This analysis also includes funding towards Washington Metropolitan Area Transit Authority (WMATA). The 64% of projects that are considered GHG-beneficial are broken down into the four pillars of GHG-emissions reductions in the transportation sector in the pie chart on the right, with the most funding towards projects that reduce emissions via VMT reduction.

This is due to the investment in transit and pedestrian and bicycle infrastructure, followed by congestion mitigation strategies, which improve travel reliability and increased efficiency.



## MDOT Capital Program Emissions-Reducing Projects



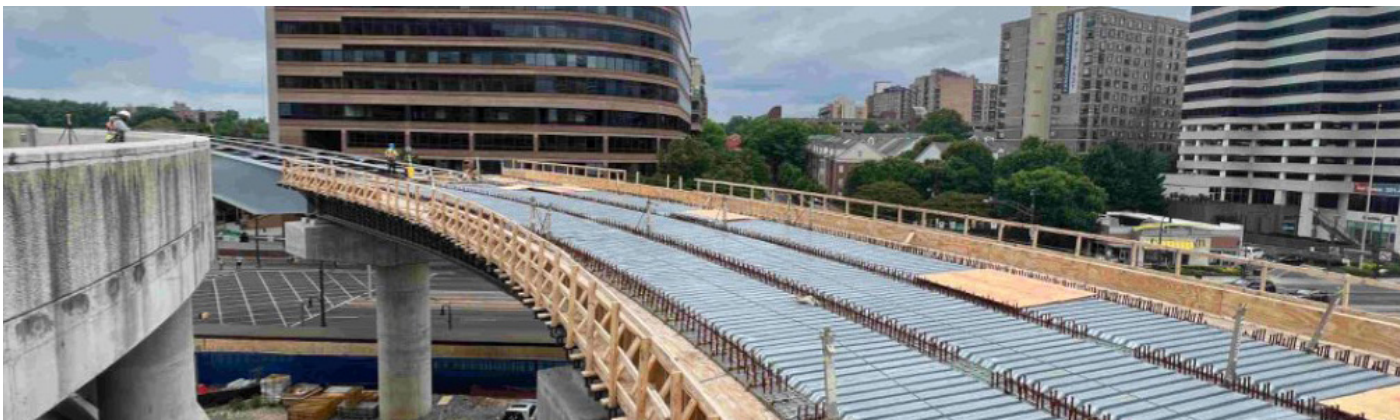
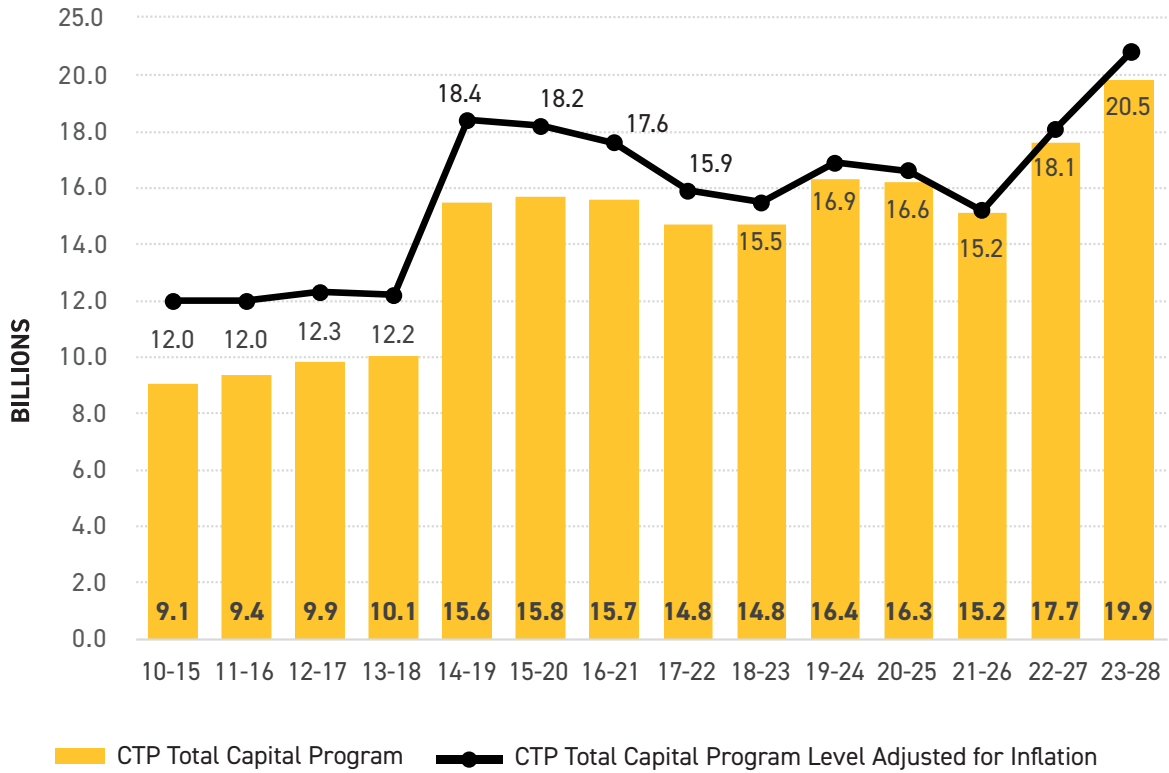
The 36% of major capital investments that are not GHG beneficial are primarily associated with spending that enhances customer service across the MDOT modal administrations and preserves and maintains Maryland's multimodal transportation system. These investments are critical to meeting MDOT's responsibilities to its customers and for keeping the system in a state of good repair. Many of the system preservation activities, such as bridge rehabilitation, stormwater management, and pavement preservation, also promote a more resilient transportation system, particularly to severe weather events—which is a priority objective of the MCCC.

## Investment By Project Type

- Transportation Technology
- VMT Reduction
- Congestion Mitigation
- Infrastructure Design

This is the last report to utilize this methodology for determining GHG-beneficial projects from the CTP in its current form. As seen in the graph below, the FY 2023-2028 CTP provided historically high levels of funding to the transportation system at \$20.5 billion.

### MDOT Total Capital Program Level (\$ in Billions)



# WHERE DO GHG EMISSION REDUCTIONS IN THE TRANSPORTATION SECTOR COME FROM?



## Transportation Technology:

Maryland's supportive policies, regulations, pilot programs, and incentives for new vehicle technologies keep the State on a course for increased

EV market penetration. In 2022, the National Conference of State Legislatures recognized Maryland as having policies that promote hybrid and EVs. Maryland's leadership in implementing the Zero Emission Vehicle (ZEV) Memorandum of Understanding (MOU) will continue to increase overall fleet efficiency across multiple modes and vehicle types. Additionally, MVA was recognized in FY 2023 by the American Association of Motor Vehicle Administrators (AAMVA) for the CAV Strategic Framework.

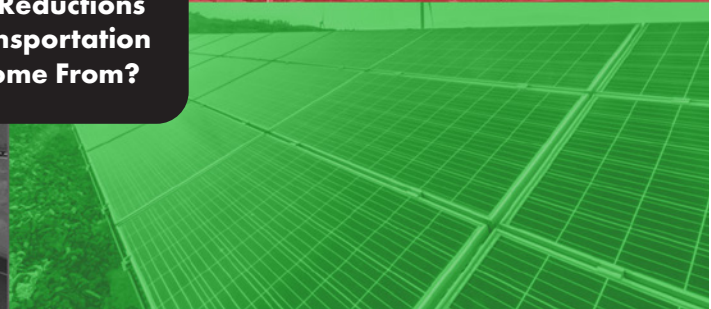


**VMT Reduction:** Reducing VMT, particularly relative to population growth, is crucial to reducing GHG emissions. The draft 2050 MTP includes a strategy to reduce VMT per capita by

20%. Strategies to change and sustain traveler behavior to use alternatives to SOV travel include a variety of approaches. For example, MDOT programs and initiatives help reduce VMT and SOV travel by investing in and supporting TDM strategies that encourage transit, cycling and walking, carpooling, vanpooling, and trip avoidance through options like telework.



## Where Do Greenhouse Gas Emission Reductions in the Transportation Sector Come From?



**Congestion Mitigation:** Reducing inefficient travel associated with traffic congestion is a primary focus of MDOT in how it manages and operates the multimodal transportation system. For

example, a car operating at 25 mph emits 25% more Carbon Dioxide (CO<sub>2</sub>) per mile than a car operating at 50 mph.



**Infrastructure Design:** MDOT modal administrations have been developing and implementing design changes to agency business processes, including updating heating and cooling systems

at MDOT facilities and using low carbon pavement in projects, that help mitigate emissions. In some cases, infrastructure decisions have also had positive impacts on the environment, such as nature-based design solutions.

# TRANSPORTATION TECHNOLOGY

New federal funding programs and commitments from the private sector to invest in alternative vehicle and fueling infrastructure have helped to bolster consumer interest and confidence in low-carbon vehicles. The adoption and acceleration of transportation technologies continue to offer the most significant opportunity to reduce GHG emissions from the transportation sector.

## MDOT'S COMMITMENT AND ROLE

MDOT is committed to taking a proactive role in the promotion and adoption of low-carbon and emission reduction vehicles and infrastructure technologies that will reduce GHG emissions and help achieve Maryland's ambitious GHG emission goals. MDOT continues to invest in State fleet electrification and the deployment of reliable charging infrastructure for use by fleets and the public. In addition, MDOT supports strategies, policies, and incentives that accelerate the adoption of ZEVs and other infrastructure technologies throughout Maryland.

## ACCOMPLISHMENTS

MDOT continues to make progress in its adoption of transportation technologies. During FY23:

- **13** EVs were purchased by the MVA, increasing the number of EVs in MDOT's passenger fleet. Charging ports were installed at the MVA Headquarters in Glen Burnie. The installation was facilitated by the Department of General Services (DGS), supporting the State's Fleet Electrification mandate imposed by the CSNA ([PS 1.12](#)).
- **15** hybrid electric cranes arrived in 2022 as part of the first shipment of full fleet electric yard cranes that will support the electrification of the container yard at the Seagirt Marine Terminal. **Four** Electric Neo-Panamax container cranes also serve the new, second, deep-water berth and support the electrification at the Terminal.
- **Eight** Battery Electric Buses (BEB) are set to be received by the MAA ([PS 1.11](#)).
- Charging is available to the public at Baltimore-Washington International (BWI) Thurgood Marshall Airport's Cell Phone lot, Rideshare Staging lot, and Express Parking lot. Additionally, three level 2 chargers, each with two ports, and one direct-current (DC) fast charger with one port are now located at SHA's Hanover Complex.



## STRATEGY PATHWAYS

The adoption of transportation technologies is a critical strategy in reducing GHG emissions from the transportation sector and achieving the State's ambitious GHG emission reduction goals. This strategy as well as other associated strategies have been identified by MDOT in the GGRA's Policy Scenario 1 and Policy Scenario 2 and are currently being implemented by MDOT. Updates on several transportation technology-related strategies are detailed below.

### **Policy Scenario 1: Public Transportation (50% EV Transit Bus Fleet) & Policy Scenario 2: 50% to 75% EV Transit Bus Fleet**

The MTA's Zero Emission Bus Transition Initiative is in the process of converting MTA's Bus Fleet to BEB and potentially Fuel Cell Electric Buses (FCEB). The Kirk Pilot BEB Project is expected to launch revenue service in January 2024, with the first seven BEBs in MTA's fleet. The Kirk Bus Facility (100% electric bus conversion) and the Northwest Bus Facility (50% electric bus conversion) are currently in procurement for a Design/Build contract.



In 2023, WMATA held groundbreaking events at its Northern and Bladensburg bus garages, which are being reconstructed to support BEBs, and secured a \$104 million Federal Transit Administration (FTA) Low or No Emissions Vehicle grant that will support the purchase of 100 BEBs for the region, conversion of the Cinder Bed Road Bus Division to a fully BEB facility, and workforce development and training. In 2023, WMATA also took delivery of its first two BEBs, and is preparing to put those in revenue service out of its Shepherd Parkway Bus Division. WMATA had previously joined transit agencies nationwide as part of the FTA Sustainable Transit for a Healthy Planet Challenge, pledging to develop a sustainability plan that details strategies to reduce carbon emissions, such as conversion to a zero-emission bus fleet, addressing climate resiliency and making stations and facilities more energy efficient. WMATA submitted its 2025 Energy Action Plan and Zero-Emission Bus Transition Plan strategies as part of the challenge, detailing how it plans to help address the region's climate challenges through sustainable transportation solutions.

### **Policy Scenario 1: Port of Baltimore Drayage Truck Replacement**

As part of the Diesel Emission Reduction Act (DERA) 2021 grant award, three electric heavy-duty dray trucks are expected to be delivered to the Maryland Port Administration (MPA) later in 2023. These will be the first zero-emission (ZE) dray trucks to serve the Port on a regular basis.

### **Policy Scenario 1: MDOT Fleet Vehicles**

MDOT continues to invest in fleet modernization and infrastructure deployment measures. MPA prepared an Electric Vehicle Roadmap to assist with transition of the light duty fleet to ZEVs. MDTA is currently preparing an EV Fleet Study that will develop strategies for the transition of MDTA's operational fleet vehicles to EV, including the installation of required charging infrastructure. SHA is also actively working to evaluate the electrical systems at SHA's Hanover and Headquarters Complexes to determine EV charging station potential for the installation of EV charging ports to support light-duty fleet vehicles at both facilities.





## CHALLENGES & OPPORTUNITIES

To accelerate adoption and ensure Maryland continues to be a national leader, MDOT will continue to support incentives for EVs, support charging infrastructure deployment, and address barriers to EV adoption, which includes ensuring charging is available to those who live in rural and disadvantaged communities, as well as those in urban environments, multi-unit dwellings, or in homes governed by homeowner’s associations.

Maryland is positioned to use NEVI, CFI, and other eligible funds in partnership with private companies as well as regional and local government to deploy EV charging stations along designated corridors and within communities. MDOT will continue to work with the utilities, the Public Service Commission, and state, local, and federal partners through ZEEVIC and the Public Conference 44 (PC44) to ensure the strategic, sustainable, and reliable installation of EV charging infrastructure in Maryland.

TSO and SHA continue to coordinate and develop Maryland’s Round 1 Program under the NEVI Formula Program. MDOT will receive over \$57 million in NEVI Formula Funds after set-asides between FY 2022-2026 to strategically deploy EV charging infrastructure in order to build-out and certify all 23 designated EV Alternate Fuel Corridors (AFC). MDOT will also coordinate with agencies and private sector partners on investments in and deploying of charging infrastructure within communities.

The adoption of the Advanced Clean Cars II Program (ACCI), which requires auto manufacturers to sell an increasing number of ZEVs, as well as ZEV purchasing requirements for fleets, will help to support a faster transition to ZEVs.

## STRATEGY BENEFITS

The adoption of transportation technologies will play a critical role in the reduction of GHG emissions from the transportation sector:

- The four additional supersized, fully electric Neo-Panamax container cranes at Seagirt Marine Terminal avoid the equivalent of 985 metric tons of CO<sub>2</sub> per year, which is comparable to 96,758 gallons of diesel consumed or over one million pounds of coal burned.
- The 45% increase in registered EVs in Maryland, including those in MDOT fleets, equates to a reduction of 700,000 metric tons, or 0.7 MMT CO<sub>2</sub>e, per year.



# VMT REDUCTION

## MDOT'S COMMITMENT AND ROLE

MDOT programs and initiatives help reduce VMT and SOV travel by investing in and supporting transit, cycling and walking, carpooling, vanpooling, telework, and TDM strategies. For transit, there is an emphasis on improving service quality and reliability, better aligning transit service to demand, and improving transit information dissemination to customers. MDOT's modal administrations work together to advance bike and pedestrian-friendly designs and policies to promote safety and opportunities for all transportation system users. MDOT provides leadership in TDM practices through its Commuter Choice Maryland program and by continuing valuable partnerships with the Metropolitan Washington Council of Governments (MWCOCG) and all of its MPOs and local government TDM program managers.

## ACCOMPLISHMENTS

TSO is currently updating the statewide Bicycle & Pedestrian Master Plan (BPMP) in tandem with the MTP due for adoption in January 2024. The BPMP update began in January 2023 with initial public engagement conducted over the spring through a survey, webinar, and in-person events. Recommendations will be drafted over the summer and a draft plan will be available for public comment in the fall. The BPMP will set bicycle and pedestrian goals and measures for MDOT and state agencies to pursue over the next five to 20 years. To more accurately reflect a person's stress level while biking between destinations, TSO is transitioning to a Level of Traffic Stress (LTS) metric for measuring how 'bikeable' roadways are for various cycling audiences. MDOT completed a statewide analysis of all public roadways based on factors like traffic speeds, volumes, number of lanes, and presence of bicycle facility. The table located below shows the most recent year's data. MDOT conducted a bicycle network analysis to determine how accessible community services were along the low-stress network ([PS 1.9](#), [PS 2.16](#)).



LTS	TARGET AUDIENCE	BICYCLE FACILITY TYPES	FY23 SHA CENTERLINE MILEAGE
0	Everyone	Shared-use paths, rail trails	—*
1	Almost everyone	Protected bikeways, side paths	115.6
2	Interested, but concerned	Bike lanes, bike boulevards	387
3	Enthusied and confident	Bike lanes, shared lanes, shoulders	519.2
4	Strong and fearless	No bike facility or on arterial roadways	3447.8
5	Bike Access Prohibited	Bicycle access is prohibited by managing roadway agency	1473.5

\*LTS 0 includes shared-use paths that are outside of the roadway right-of-way and are not parallel to the adjacent roadway. Therefore, as such, MDOT SHA does not manage any LTS 0 facilities.

SHA is investing in projects that would enhance pedestrian and bicyclist access. These include constructing a new 10-foot wide, ½ mile long shared-use path and buffer along on US 1 (Rhode Island Avenue) from Charles Armentrout Drive to Farragut Street to connect the Rhode Island Avenue Trolley Trail to the Anacostia Tributary Trail, adding a sidewalk on southbound US 1, improvements to a 360-foot long retaining wall, and partial reconstruction of the existing US 1 bridge over Dorsey Run between Cedar Avenue and Crestmount Road. In the summer of 2023, construction began on a new sidewalk, a grass buffer to the existing sidewalk, a pedestrian bridge over the Big Elk Creek, and other improvements from the intersection of MD 7D (Delaware Avenue) and MD 281 (Main Street) to Meadow Park in the Town of Elkton ([PS 1.9](#), [PS 2.16](#)).

MTA expanded access and improved reliability as part of its fall 2022 service changes. This included a new LocalLink 32 between University of Maryland Baltimore County (UMBC) and Patapsco Light Rail, new 24-hour access to Morgan State University and Johns Hopkins University on the CityLink Silver, and improved accessibility to Patapsco Light Rail on the LocalLink 26 ([PS 1.4](#), [PS 2.11](#)). In December 2022, MTA also completed the new MARC Riverside Heavy Maintenance Facility in Baltimore, a \$64.2 million project improving MARC Train maintenance and operational efficiency ([PS 1.4](#), [PS 2.11](#)).

In June, Governor Moore announced the re-launch of the Red Line project, a proposed premium transit corridor between Woodlawn, downtown Baltimore, and Bayview. Planning activities are ongoing to select an alternative to advance to detailed environmental study, and ultimately apply for major Federal funding in the fall of 2024. This planning work is building on both the many years of previous Red Line study, and the East-West Corridor feasibility study ([PS 1.4](#)).

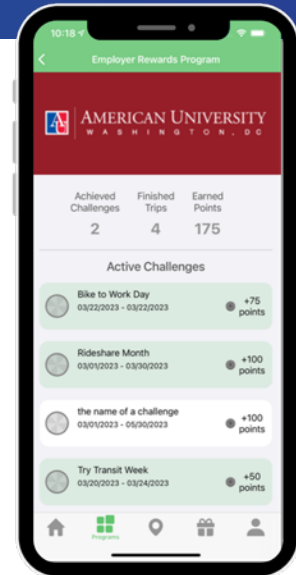


MTA won three Awards of Excellence from Maryland Quality Initiatives (MdQI) at the organization's 30th Annual Conference, highlighted by a *Project of the Year Over \$5 Million* award for improvements along Baltimore's North Avenue corridor. The North Avenue Corridor Improvement Project was the centerpiece of the \$27.3 million North Avenue Rising initiative, which is the result of a partnership between the U.S. Department of Transportation (USDOT), the state of Maryland, and Baltimore City. North Avenue Rising was designed to support economic revitalization along North Avenue, a vital east-west roadway.

MVA Customer Connect, the landmark information technology (IT) system that has made the lives of Marylanders more efficient, marked its one-year anniversary on December 6, 2022. Through Customer Connect and MyMVA, the percentage of Alternative Service Delivery (ASD) transactions has increased to 76% in FY 2023, helping MVA customers reduce vehicle trips to MVA facilities for services. MVA continues to provide convenience and reduced mileage to Maryland customers under the One-Stop-Shop government services. After successfully issuing more than 2,000 birth certificates to Marylanders since March 2022, the program has been expanded to six branches: Annapolis, Baltimore City, Easton, Essex, Frederick, and Largo.

MDOT's Commuter Choice Maryland program oversees the Maryland Commuter Tax Credit which, was expanded in July 2022 to offer greater incentives to employers for subsidizing non-SOV commute options for their employees. In addition to the existing options of transit, vanpool, employer-sponsored Guaranteed Ride Home, and Cash in Lieu of Parking, new options including carpool, active commuting (walk/bike/scooter), telework, and last mile multimodal connections are now eligible programs that employers may subsidize for their employees and claim back 50% of the cost, up to \$1,200 per employee per year ([PS 1.7](#)).

MDOT continues to support the development of incenTrip, a free mobile application that offers trip planning assistance and rewards commuters for choosing non-SOV travel options during peak weekday commute times. New rewards have been added and new features have been developed including customizable multimodal trip planning, an employer dashboard for workplace commute challenges, and corridor challenges that focus on incentivizing ridesharing and transit use on specific congested corridors including US-50 (Bay Bridge), I-95 (MD32 to Baltimore City), and I-695W (from I-95 to I-95) (PS 1.7).



## STRATEGY PATHWAYS

Updates on MDOT’s GGRA strategies that relate to VMT reduction are below.

### **Policy Scenario 1: Public Transportation (new capacity, improved operations/frequency, bus rapid transit (BRT))**

MTA continues to provide access to mobile transit ticketing through CharmPass, as well as options for those with a more flexible commuting schedule with CharmFlex. In August 2022, MTA also added real-time train arrival information for its Light Rail trains, available to riders on the Transit app. These operational improvements make transit a more attractive option to riders.

In 2022-2023, WMATA increased rail service levels by 50% across the system and opened seven new rail stations, including beginning new rail service to Dulles Airport. WMATA also kicked off community engagement for the Better Bus Network Redesign, which will develop a new regional bus network that better serves customer needs and regional goals by being fast, frequent, reliable, and easier to understand. Additional bus improvements included: implementing the open stroller initiative, updating Customer Information System to eliminate the “ghost bus” issue, improving digital arrival time information at bus stops, and continuing work with Maryland partners to implement bus priority treatments. To further encourage ridership recovery, a variety of fare updates were implemented, including a bus to rail transfer discount of up to \$2, a \$2 weekend flat fare on rail and a variety of new passes. Finally, WMATA began accepting enrollment to MetroLift, an income-qualified reduced fare program for SNAP eligible customers to receive a 50 percent discount on rail and bus trips. These service and fare enhancements are critical to ensuring more people ride transit, which in turn helps meet MDOT’s climate goals.

### **Policy Scenario 1: Intercity Transportation Initiatives (Amtrak Northeast Corridor, Intercity bus)**

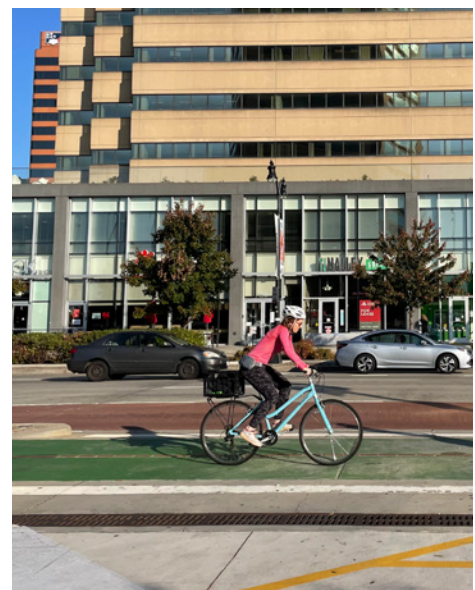
Amtrak has recently submitted federal funding grant applications for nearly \$7.3 billion for 14 proposed Northeast Corridor projects, including tunnel and bridge replacements to modernize critical infrastructure, improve stations and expand Amtrak service. This is part of an FRA federal-state partnership grant program that is expected to provide \$24 billion in funding for Northeast Corridor improvements.

### **Policy Scenario 1: Transportation Demand Management (TDM)**

Commuter Choice Maryland is working in collaboration with local TDM program managers to increase participation in the free Employer Partner Program to 500 employers statewide, a goal set by the MCCC.

### **Policy Scenario 1: Bicycle and Pedestrian Strategies (Provision of non-motorized infrastructure including sidewalks and bike lanes)**

MDOT plans, funds, and builds bicycle and pedestrian infrastructure which is context appropriate and encourages mode shift. The updated statewide BPMP will be published in early 2024 to provide additional guidance.



**Policy Scenario 2: Transit-Oriented Development (TOD) Build-Out**

MDOT Office of Real Estate & Economic Development (ORED) is currently pursuing strategic opportunities for TOD and joint development projects around each of the State’s transit assets. Projects include advancing a Reisterstown Plaza joint development master plan, developing a Penn Line TOD Strategy for stations on the MARC Penn Line, pursuing a Baltimore Investment Study to incentivize impactful TOD in the Baltimore region, partnering with WMATA on pursuing Joint Development Studies at eight Metrorail stations in the State, and working with the Purple Line Corridor Coalition and local jurisdictions on strategic opportunities for planned stations on the Purple Line.

**Policy Scenario 2: Freight Villages/Urban Freight Consolidation Centers**

The [Maryland Freight Plan](#) advances discussions on local freight consolidation centers highlighting the demands from e-commerce to develop efficient means to distribute and deliver goods locally to their final destinations.

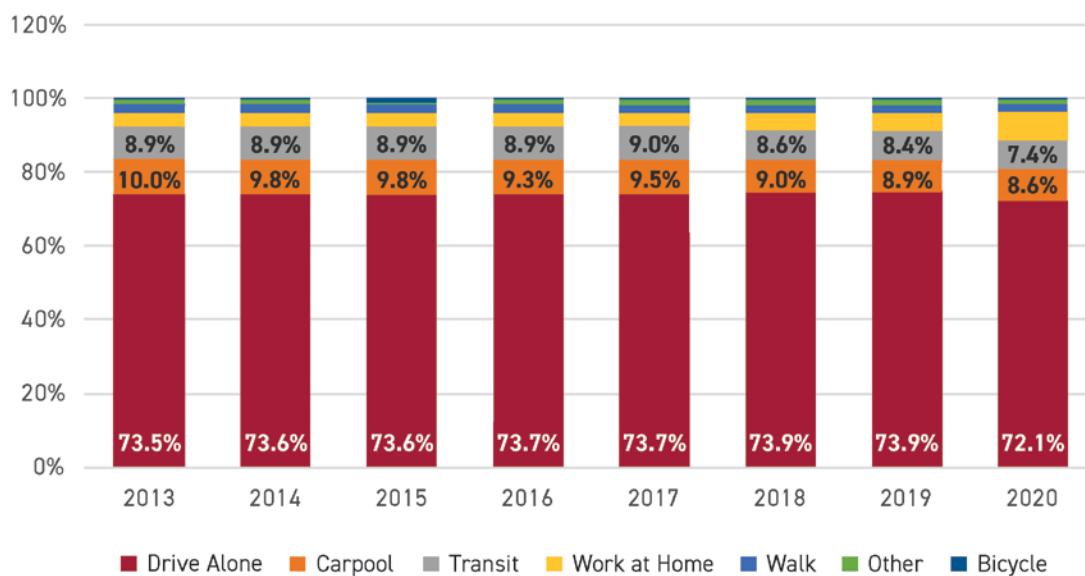
**CHALLENGES AND OPPORTUNITIES**

In September 2022, MDOT awarded \$35.7 million in grants to 53 bicycle, pedestrian and trail projects through the Transportation Alternative, Recreational Trails and the Kim Lamphier Bikeways Network Program. The Bikeways Program awarded \$2.6 million for the planning, design and construction of 21 bicycle transportation projects, mostly shared-use paths and protected bikeways.

MTA received \$6 million federal grant from the USDOT 2022 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program. The grant will assist the \$12 million Building Baltimore Penn Station Connections project to improve access in and around Baltimore’s Penn Station, particularly bicycle and pedestrian infrastructure improvements. MTA also received \$20 million for the Mondawmin RAISE Transit Hub Project to support upgrades to the station’s transit infrastructure and improve pedestrian accessibility in the surrounding area.

Pre-pandemic data showed an increase in telework, which accelerated during the pandemic. The figure below shows a 47% increase in telework mode share from 2019 (5.0%) to 2020 (8.1%). According to the U.S. Census, Maryland had one of the highest percentages of home-based workers in 2021 at 24%. In 2023, WalletHub ranked Maryland the third best state for working from home. In November 2022, the Maryland Department of Commerce launched the \$1 million Business Telework Assistance Grant Program, which provides grants of up to \$25,000 to help businesses expand telework capabilities for their employees. The future of telework remains uncertain as employers’ hybrid policies take hold across the public and private sectors.

**Commute Mode Share 2013-2020**



Source: American Community Survey 2020 5-year estimates

Commuter Choice Maryland continues to seek additional state and local organizations, nonprofits and private sector companies as partners for its Commuter Choice Maryland Employer Partner Program. Through the program, Commuter Choice Maryland partners with organizations to help them promote commuter benefits and recognizes employers across the state who are leaders in promoting alternative commuting options and benefits. These partners help Maryland achieve important goals such as reduced traffic congestion, cleaner air and fewer GHG emissions, as well as increased economic opportunity [\(PS 1.7\)](#).

In 2022, the Maryland Department of Labor created a “Jobs that Build Employer Fund,” which included the opportunity for employers to use grant funds to offer public transit and vanpool subsidies to employees.

MDOT supports nine local government TDM programs, including those within the Washington, D.C., Commuter Connections network, with Congestion Mitigation and Air Quality Improvement Program (CMAQ) funding and collaborative program development to offer free commuter assistance and to support employers in their efforts to develop commuter benefits programs.



## STRATEGY BENEFITS

Federal funds such as CMAQ, CRP, RAISE, and other funds can support GHG reduction and congestion reduction benefits in Maryland. This includes traffic signal synchronization, TDM programs that promote ridesharing, transit, active commuting, and telework, transit improvements, transit bus replacements, and Metro rail-car upgrades. MDOT’s incenTrip application functions as a statewide congestion mitigation effort as it encourages Maryland commuters and employers to increase the use of public transportation, carpooling, vanpooling, walking, and biking.

MTA’s redevelopment of Baltimore’s Penn Station, funded in part by the USDOT’s RAISE grant, will expand access to the local disadvantaged community, more than 20% of which lacks access to a car.





# CONGESTION MITIGATION

## MDOT'S COMMITMENT AND ROLE

Traffic congestion and idling, or operating vehicles at low speed, can increase GHG emissions as a result of additional fuel use and reduced engine efficiency at low speeds. Reducing congestion not only reduces emissions, but also helps improve air quality, travel reliability, and quality of life for Marylanders.

The MDOT integrated approach to congestion mitigation is administered under the TSMO umbrella of programs at SHA ([PS 1.2](#), [PS 2.3](#)). The agency's TSMO approach, and other modal administration multimodal programs and projects, result in emission reductions by decreasing delay to improve mobility, reliability, and safety for transportation system users. SHA's TSMO strategies leverage decreasing delays technology to optimize capacity that is limited by congestion.

Among the programs and initiatives targeting congestion mitigation, SHA's CHART program utilizes Intelligent Transportation Systems (ITS) technologies to enhance travel and address inefficiencies to reduce GHG emissions ([PS 1.2](#)).

## ACCOMPLISHMENTS

SHA's CHART program has developed into a multi-jurisdictional and multi-disciplinary program that expands throughout the entire state of Maryland. During 2022, CHART provided a total of 63,474 incident responses and disabled vehicle assists. In addition to routine patrols, SHA's CHART program provides a seasonal enhancement each year on Fridays, Saturdays, Sundays, and holiday Mondays between early May and late September, deploying additional patrols along the US 50 corridor between the Bay Bridge and Ocean City, MD. In 2022, as part of CHART's Eastern Shore Traffic Operations Expansion, additional patrols were added on Thursdays as a permanent enhancement to this seasonal program based on observed changes in travel patterns ([PS 1.2](#)).

The University of Maryland Center for Advanced Transportation Technology (CATT) Lab continues to support SHA by forecasting traffic conditions for the days immediately prior to, during, and after holidays for the National Capital and Baltimore regions. Using congestion patterns for those holidays in previous years will assist in anticipating and reducing congestion on State roadways, improve mobility, safety, and efficiency, and lead to fewer emissions and GHG reduction.

MAA initiated a BWI Curbside & Approach Roadway Improvement Study in FY 2023 to identify ways to reduce curbside congestion, manage traffic, and improve efficiency to reduce dwell and idle times, reduce emissions, and improve safety. Additionally, BWI Marshall is currently removing existing guidance systems and installing new space monitoring equipment for parking facilities, which will reduce congestion within the hourly parking garages.

In April 2023, new mass transit signs were added to the BWI Marshall Terminal to alert the public of the various public transit options they can utilize to get to and from the airport. MAA is working to better accommodate Transportation Network Companies (TNC) such as Uber and Lyft at the airport. These services provide an environmental benefit by better utilizing individual vehicles delivering patrons to and from the airport, reducing congestion and parking space required. Some TNCs offer a reduced rate for passengers willing to share a ride to a similar destination, which can reduce the number of individual vehicles on the roadway, potentially reducing emissions and congestion. MAA has established a permanent staging area for these vehicles, which include EV charging ports to accommodate cleaner vehicles and encourage TNC fleet conversion.

The Dundalk Marine Terminal (DMT) Truck Plaza is a new improvement project that eliminates a stop for truckers coming into DMT, and therefore will reduce idling and truck emissions.

## STRATEGY PATHWAYS

Congestion mitigation is a key part of MDOT’s plan to reduce GHG emissions. Updates to several strategies from the GGRA-related to congestion mitigation are provided below.

### **Policy Scenario 1: On-Road Technology (Transportation System Management and Operations - CHART and other traffic management technologies)**

SHA’s CHART program continues to reduce congestion and improve travel efficiency by responding to incidents and clearing obstructions from the highway quickly, with an average incident response time of 12.85 minutes in 2022. CHART has enhanced services during highly trafficked time periods and has recently expanded this program.

### **Policy Scenario 1: Freight and Freight Rail Programs (National Gateway, Howard Street Tunnel, and MTA rail projects)**

The Port of Baltimore was awarded a grant totaling \$15.6 million from the Federal Railroad Administration Consolidated Rail and Infrastructure Safety Improvements (CRISI) Program for a Rail Capacity Modernization Project. The funds will be used to build four new rail tracks adding 17,670 track feet and two crane rail beams, totaling 7,000 linear feet within the Seagirt Marine Terminal. The project will boost job creation while significantly improving air quality around the Port by reducing truck congestion.

### **Policy Scenario 2: TSMO/Integrated Corridor Management (Limited Access System) & TSMO/Integrated Corridor Management (Arterial System)**

While CHART is an ongoing program, SHA is investing in other TSMO/ICM projects, including the I-695 (Baltimore Beltway) I-70 to MD 43 (White Marsh Blvd) project, which includes TSMO strategies, such as converting a shoulder into a travel lane during rush hours to reduce congestion and idling, and active traffic management to communicate with the traveling public. The design, pre-construction, and construction stages of the project will occur concurrently through 2024.

## CHALLENGES AND OPPORTUNITIES

Increasing demands on Maryland’s transportation system, particularly due to increases in freight travel, continue to result in reliability challenges. As a result, even relatively minor disruptions can lead to significant system-wide delays. Harnessing technology through the deployment of systems along roadways and in vehicles to reduce delays, clear traffic incidents efficiently, and provide accurate and real-time traveler information continues to help transportation agencies and system users make better decisions to manage or avoid congestion.

## STRATEGY BENEFITS

The results of CHART’s efforts in CY2022 include nearly eight million gallons of fuel and approximately two million hours of truck delay, in addition to the emissions reduction (more than 70,000 mt CO<sub>2</sub>) ([PS 1.2](#)). Since CO<sub>2</sub> is recognized as a primary factor for global warming, this study also included the estimated emissions reduction in dollars, based on information from the Energy Information Administration. In 2022, the reduction in emissions resulted in a total savings of 46.81 million dollars, generating a total net benefit of 2.03 billion dollars. Most benefits were produced from the reduction in delay due to CHART’s efficient incident response and management, especially along the major corridors, which are the primary contributors to traffic congestion in Maryland.

CY2022 CHART BENEFITS	
Truck Delay (vehicle hours reduction)	1,994,218
Fuel Consumption (gallons)	7,778,515
Emission (MT CO <sub>2</sub> )	71,201
<b>TOTAL COST SAVINGS (\$)</b>	<b>\$2,030,560,000</b>



# INFRASTRUCTURE DESIGN

## MDOT'S COMMITMENT AND ROLE

MDOT is establishing itself as a leader in developing innovative and environmentally friendly infrastructure design that results in a range of benefits, including reducing GHG emissions, minimizing climate impacts, and enhancing resilience. MDOT continues to take steps to ensure that its assets and facilities are powered and designed to minimize their environmental impact. A large piece of this is keeping MDOT assets in a state of good repair and updating facilities when necessary to optimize energy efficiency. This asset management, from facilities to vehicles, reduces the environmental impacts but also makes them more resilient to climate impacts. Additionally, MDOT takes steps - through programs such as Context Driven Design Guidelines- to ensure its infrastructure and roadways are multimodal and designed to safely promote low-impact forms of travel.

## ACCOMPLISHMENTS

MDOT's modal administrations continue to upgrade facilities to reduce their environmental impacts and create greater efficiencies. For example,

MPA's electrical maintenance department has installed new interior and exterior Light-emitting Diode (LED) lighting in several areas throughout the DMT and South Locust Point Marine Terminal. During FY 2023, MVA worked on a retaining wall at Largo Branch; VEIP station assessments; parking lot and 1st floor branch renovations at Glen Burnie; exterior pole LED lighting conversion at Gaithersburg, Frederick, Largo; and a roof replacement at Easton.

MAA's BWI Marshall A/B Connector and Baggage Handling System improvement project, currently in design, is projected to achieve a 24% energy cost saving through improved lighting, chiller replacement, hot water heating, building design and control systems. This includes upgrades of the central utility plant and lighting improvements on the adjacent lower-level roadway to comply with the Maryland State Energy Code. The primary terminal taxiway supporting approximately 70% of the BWI passenger activity is undergoing a multi-phase, multi-year reconstruction to maintain critical airfield infrastructure and provide a safe, secure, and resilient transportation system. With assistance from the FAA Airport Improvement Program (AIP) and Coronavirus Aid, Relief, and Economic Security (CARES) Act, Phase 1a was completed in 2022 that reconstructed 26,000 square yards of existing asphalt taxiway in concrete and replaced the taxiway lighting and signage with high efficiency LED lighting systems. These improvements enhance airfield safety at night and reduce energy demand and operational costs. Subsequent phases of this project are being designed and programmed for construction over the next five fiscal years.

MAA's BWI Concourse DX-DY HVAC Improvements will replace HVAC systems serving Concourse DX-DY that have been in service between 20 and 30 years and install updated and integrated system controls to optimize efficiency. Also, MAA secured the purchase of 15,000 MW hours of renewable electric power for FY 2024 and FY 2025. Working closely with Maryland Department of General Services and Washington Gas, this purchase was arranged under existing contracts and budgets and is exclusive to BWI Marshall. Previously, BWI Marshall's energy portfolio included 20% renewable energy purchased from wind and solar projects. With the above purchase, this number increases to 40%.

Some of MPA's upcoming projects include upgrades at the Seafarers building on Locust Point, which will have 25 - 2'X2' light fixtures installed, and 12 fixtures in the new container tunnel for the CruiseMaryland terminal. LED lighting upgrades will also be installed in the World Trade Center Baltimore, including the main lobby and the outdoor arcade. The LED upgrades reduce electricity usage, increase worker safety, and help to lower GHG emissions.

SHA received a grant as part of the Federal Highway Administration (FHWA) Climate Challenge to investigate the service life and environmental performance of products and materials used in highway projects, such as asphalt and concrete. The research will help SHA better understand opportunities for GHG emission reduction from materials used in road construction and maintenance to help set environmental performance measures for Maryland projects, and could help establish benchmarks in the future.

MDTA is upgrading existing tunnel lighting within the Baltimore Harbor Tunnel with energy-efficient LED lighting fixtures. New lighting will be monitored and controlled by an intelligent lighting control system with automatic dimming capabilities for required nighttime and daytime luminance levels, further improving energy savings. MDTA will be planning for a lighting replacement program in FY 2024. Through this program, additional exterior light fixtures and building interior fluorescent fixtures will be replaced with LED types. The LED fixtures will allow for reduced energy consumption and utility bill costs as well as decreased labor expenses for bulb replacement and maintenance.

In FY 2024, MVA is planning to complete various power distributions, electrical upgrades, and roof replacement projects at nine branches, and will be initiating a full remodel of the Largo Branch. MVA has also adopted the Target Net Zero End of Emissions Reduction Program by utilizing technology solutions for emission reduction by upgrading their HVAC systems. In addition, MVA continues to lower their HVAC costs and carbon emissions with the use of building automation system controls to monitor ventilation and air quality, scheduled routine maintenance, and HVAC filter changes.

In 2022, MAA successfully expanded its composting efforts to include most vendors that resulted in 73.62 tons of food waste diverted from the landfill. By diverting food scraps away from landfills, MAA helps reduce greenhouse gas emissions. In March 2023, 9.34 tons of food scraps were collected, which avoided 8.23 tons of carbon dioxide equivalent emissions from entering the atmosphere, that is equivalent to taking 21 cars off the road.



## STRATEGY PATHWAYS

Most PS1 and PS2 strategies fall under the previously mentioned other three umbrella strategies MDOT follows to reduce GHG emissions: Transportation Technology, Congestion Mitigation, and VMT Reduction. However, several strategies are related to infrastructure design. Updates on one of these strategies is detailed below.

### ***Policy 1: Pricing Initiatives (Electronic Tolling)***

All MDTA facilities are cashless via E-ZPass or video tolling as of 2020. This strategy was achieved ten years ahead of time.

## CHALLENGES AND OPPORTUNITIES

Several challenges, as well as opportunities, exist as MDOT continues to run its facilities and infrastructure efficiently:

- Capital funds: Acquiring new equipment requires money for feasibility studies and equipment procurement that competes with other agency priorities.
- New equipment management: The new equipment and technology requires maintenance expertise that may not be available in-house.
- Procuring EVs: Current approved state EVs contracts includes language to supply light-duty vehicles only.
- Solar siting challenges: Requirements such as glint and glare analysis, weight considerations over existing infrastructure, and proximity to the runways take away considerations for additional solar systems.
- Public and private partnerships: As more companies have carbon emission targets, there are more opportunities to partner with our Tenants on projects.
- Emerging Technologies: As technology improves for climate mitigation, usually so does the return on investment.
- Emerging regulations: As more state and federal emission reduction mandates become law, there is increased demand to expedite emission reductions.

## STRATEGY BENEFITS

MTA's Northwest Bus Facility's solar generation of 494.3 megawatt hours (MWh) results in an annual emission reduction of 350 metric tons of CO<sub>2</sub>e. MVA has implemented several energy efficiency measures, including replacing two 250-ton chillers with models featuring Variable-Frequency Drives (VFD). The chilled water pumps and condenser water pumps will also have VFDs. The energy savings is estimated between 30% to 50% thereby reducing GHG. MVA is replacing 2- 5,100,000 British Thermal Unit (BTU) boilers currently operating at 83% to the highest efficiency 95% condensing gas fired boilers. Within the scope of work VFDs will be added to hot water pumps. This modernized task will reduce emissions by 33% with the use of VFDs. MVA is coordinating a power usage/power generated study at the Glen Burnie Facility after a redesign of 1960 technology to modern systems like LED conversion, building automation systems and window tinting that has been performed in recent years.



MAA embarked on a series of upgrades for BWI Marshall Terminal. Restrooms were upgraded with state-of-the-art technology including energy efficient LED lighting and efficient water fixtures that will yield a 20% consumption savings per average passenger using the restroom. The first phases of construction started in November 2022 with completion expected in April 2024. The Aircraft Rescue and Fire Fighting (ARFF) Bays Heating and Vehicle Exhaust Upgrades will remove the existing ducted vehicle exhaust systems within the EMS and Fire Apparatus Bays and replace them

with self-contained, circulating exhaust filtering and removal equipment. These upgrades will result in energy efficiency gains from the new HVAC system and LED lighting. MAA is working on a \$1.5M program to install Pre-Conditioned Air and 400 Hz ground power at four BWI Marshall airport which will reduce energy costs for airlines, improve air quality, and increase energy efficiency at the airport. The design is complete and set to bid in May 2023. The expansion of the AB connector in the terminal will replace the Baggage Handling System and increase space in the gate area for passengers and commercial activities. As part of BWI Marshall Long Term parking Lot B Rehabilitation, some LED bulbs were replaced, which can result to a 24% energy cost savings. In addition to these terminal upgrades, MAA is upgrading BWI Marshall's BGE Feeder to improve electric system reliability and replacing outdated incandescent runways at Martin State Airport with LED lighting.



# CLIMATE CHANGE ADAPTATION AND RESILIENCE



## MDOT'S COMMITMENT AND ROLE

Maryland has been a leader in integrating climate change resilience and adaptation into agency processes by identifying system vulnerabilities, investing in resilience projects and activities, coordinating with partners and stakeholders responding to the challenges, and communicating the potential risks and benefits of action to transportation system users.

MDOT is currently preparing a Transportation Resilience Improvement Plan (TRIP), a voluntary opportunity for comprehensive resiliency planning established under the PROTECT program of IJJA. The TRIP will help to establish a system-wide approach to transportation resilience, including assessing vulnerabilities of transportation assets to current and future natural hazards.

**MDOT's draft 2050 MTP has climate change adaptation and resilience as a throughline, with "Promote Environmental Stewardship" as a goal and the following guiding principle:**

*Resilience: Improve the transportation system's ability to provide reliable service throughout natural weather events and man-made threats.*

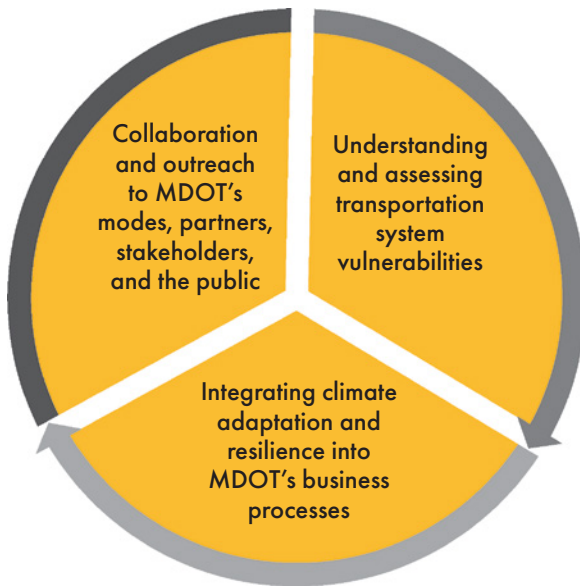
MDOT continues to develop and implement a comprehensive system-of-systems approach for enhancing resilience and mitigating risks and vulnerabilities, while improving agency response through planning, maintenance, management, and communications. MDOT's approach focuses on enhancing multimodal transportation infrastructure resilience through best practices to mitigate impacts, respond to transportation disruptions, and recover to normal operations. MDOT is making steady progress across the modal administrations in close coordination with other agency partners, key stakeholders, and system users through information sharing and outreach.

## ACCOMPLISHMENTS

In FY 2023, SHA led multiple wetland and stream restoration projects. Three stream restoration projects (Rosemary Lane, Terrapin Branch, Middle Patuxent River) and one wetland creation project (Gossage) have been completed. SHA completed two projects that were a combination of both enhancements (Brookeville Bypass and MD 355 over Little Bennett Creek). In FY 2024, SHA is looking to complete one wetland creation and banking project at Tennyson Farm, a combination of wetland creation and stream restoration at the US 219 bridge over the Youghiogheny River, and a remediation, adaptive management project at Watkins Mill.

During its next five-Year National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System permit period, MVA will improve stormwater management best management practices (BMPs) at two of its branch locations to meet the 20% stormwater restoration requirements set forth by MDE. The BMP projects include designing and constructing a submerged gravel wetland at the Frederick Branch and a wet pond at the Salisbury Branch.

In FY2023, TSO's Urban Tree Program, in partnership with the Department of Natural Resources and the Maryland Urban and Community Forestry Committee, provided funding to community groups and non-profit organizations to help plant 346 trees to improve air quality and help address the urban heat island effect. MPA is planning to relaunch the Urban Forestry Partnership in FY 2024 and FY 2025. This program works closely with surrounding communities to restore tree canopy on streets and parks in Baltimore City. Between 2018 and 2020, the Partnership planted 1,500 trees in neighborhoods across Baltimore.



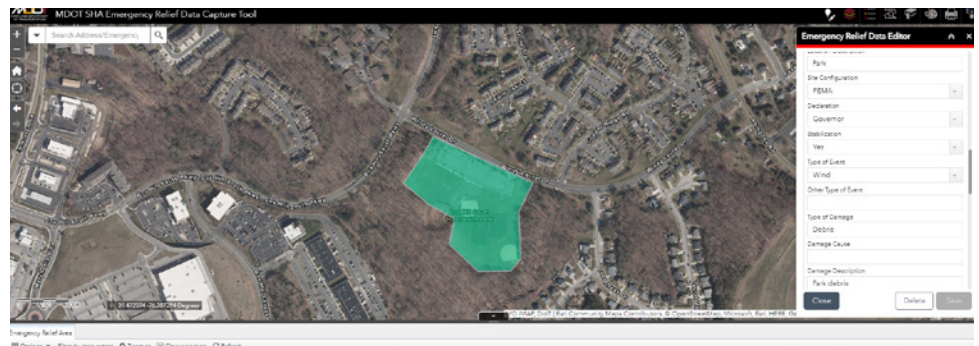
## UNDERSTANDING AND ASSESSING TRANSPORTATION SYSTEM VULNERABILITIES

The Climate Change Vulnerability Viewer (CCVV) visualizes current and future flood inundation associated with projected sea level rise. SHA expanded the CCVV data to include additional data resources for the environment, emergency management facilities, and other infrastructure crucial for identifying redundancy, vulnerabilities, and resiliency opportunities on and along the transportation network. In partnership with the Eastern Shore Regional GIS Cooperative (ESRGC), eight of 13 coastal counties in Maryland will be updated in the CCVV. SHA is working with DNR to incorporate MyCoast data, citizen reported flooding events, into the CCVV to increase understanding of flooding locations. Other data incorporated into the CCVV include the Coast Smart Climate Action Ready Plan Riverine Flooding Data.

SHA's Emergency Relief Data Tool assists in data collection following a natural disaster or other catastrophic event. The application is designed to collect key data for affected sites located on and along the MDOT SHA's

transportation network and allows a state employee to enter specific details onsite in real-time while assessing the damage that occurred. After development of the tool, the state is working to test and implement the tool throughout the Districts and Office of Maintenance.

SHA developed an Asset Management Plan for slope, embankment, and ground modification assets, as well as for Stormwater Assets, which document how vulnerability is assessed as well as their approach to resilience. Effort includes capturing asset condition and criticality in ArcGIS to apply a risk score to proactively identify vulnerability before failure and emergency events. Utilization of this data will better support funding needs for additional data collection, imagery development, design, and improvement implementation.



## INTEGRATING CLIMATE RESILIENCE AND ADAPTATION INTO MDOT'S PROCESSES

SHA is increasing the integration of climate resilience considerations into the Highway Drainage Manual, which sets drainage design standards for MDOT projects and documents policies and considerations for drainage infrastructure design.

MDTA developed a Climate Resiliency checklist for assessment during project development. This included Climate Resiliency Implementation presentations for access by Engineering disciplines to consider climate resiliency as part of project development. MDTA is also developing Case Studies of projects that reflect climate resiliency. A key project is considering sea-level rise and tidal surge to protect the tunnels at Fort McHenry and Baltimore Harbor.

Enhancements to SHA's Statewide Transportation Operations Response Map (STORM) app added additional layers of information to its GIS mapping interface. These enhancements include the display of roadway conditions from SHA's Mobile Roadway Information Systems (MARWIS). MARWIS are electronic sensors mounted on SHA and MDTA emergency response vehicles that provide real

time roadway and weather conditions along segments of the highway. The devices send back the readings in near real time and are displayed internally for enhanced decision making during weather emergency operations. The road condition color coded segments are displayed for public information and enhance traveler information.

## **COLLABORATION AND OUTREACH TO MDOT MODAL ADMINISTRATIONS, PARTNERS, STAKEHOLDERS, AND THE PUBLIC**

Following a successful pilot in the fall of 2022, oyster shells are collected at two oyster bars at BWI Marshall Airport and are picked up by the Oyster Recovery Partnership (ORP). ORP then reuses the shells by cleaning and treating them with baby oysters (called spat) and then puts them back into the waters of the Chesapeake Bay. Approximately 1,500 oysters are collected weekly at BWI Marshall. Oyster reefs are crucial to the health of the Chesapeake Bay as they filter water, sequester carbon, and provide habitat for other species. One oyster sequesters eight grams of CO<sub>2</sub> per year and filters 50 gallons of water a day.

MMA completed a Dam Breach Analysis on stormwater management pond B-6 as part of the stormwater as-built acceptance process administered by MDE. The analysis is associated with the constructed Midfield Taxilane Rehabilitation project, which converted the stormwater management facility to a sediment basin during construction and restored it to a stormwater management facility.

MVA has partnered with the DNR to support their Tree-Mendous Maryland Program. The program focuses on planting native trees on public lands, school properties, and community open spaces. MVA promotes the Tree-Mendous Maryland Program by allowing its customers to participate in environmental stewardship through donations at checkout, when conducting online or self-service (kiosk) transactions to register or renew their vehicle registrations.

The MPA and Army Corps of Engineers advanced the Barren Island portion of the Mid-Chesapeake Bay Island Ecosystem Restoration Project to construction in early 2023, continued design efforts for James Island, and convened the Mid-Bay Resiliency Working Group to maximize the coastal resiliency benefits and to incorporate nature-based solutions into the design of the project. The Mid-Bay project includes restoration of 2,072 acres of lost remote island habitat on James Island and a minimum of 72 acres of remote island habitat on Barren Island.



Since November 2022, the MVA's Investigation and Security Services division has been working with the US Department of Homeland Security (DHS) to conduct natural hazard vulnerability assessments of MVA facilities throughout the State to improve overall safety and resiliency. These findings and recommendations will be consolidated and implemented in the upcoming years.

SHA again participated in the statewide Maryland Resiliency Partnership for the Flood Awareness Campaign in April to increase public awareness about the various risks of flooding.

## CHALLENGES AND OPPORTUNITIES

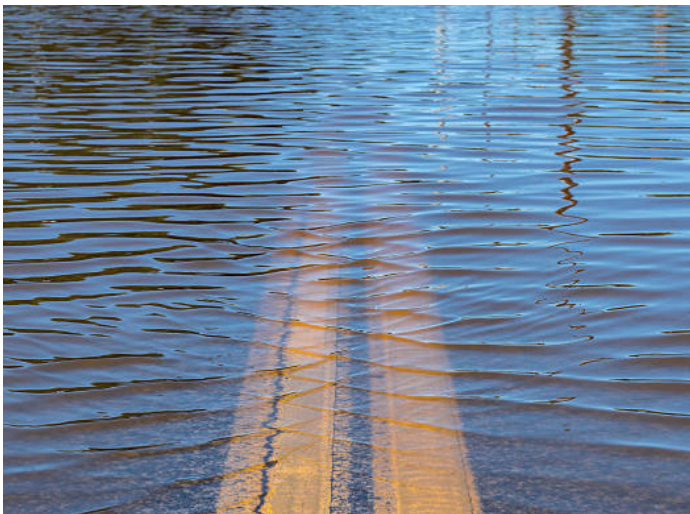
MTA is working on studies and designs to improve drainage and mitigate roadway or asset flooding at the Mt. Washington Light Rail Station and the Light Rail Grade Crossing on Camp Meade Road (MD 170).

MPA received grants that provide funding for projects that mitigate flood risks and improve coastal resiliency. MPA was awarded a grant under the FHWA Climate Challenge Project to partner with the University of Maryland to study dredged material (DM) blends for vegetative berms to slow stormwater flows and reduce flood risk. This will involve creating and testing DM and DM blends with appropriate geotechnical properties, acceptable environmental properties, and ability to rapidly establish vegetation in a berm setting. MPA was also awarded a \$150,000 Federal Emergency Management Administration (FEMA) grant under its [Building Resilient Infrastructure and Communities Program](#) (BRIC) to update flood and storm vulnerability assessment to help inform overall resiliency at its marine terminals.

During FY 2023, the BRIC grant program provided SHA with funding for preliminary shoreline design activities along the Saint George Island coastline, including desktop wind and wave analysis, coordination with permitting agencies, and preliminary shoreline design/plan development. For FY 2024, it is anticipated that the designer will develop 30% complete shoreline stabilization plans for all three targeted erosion sites along MD 249 on the eastern shoreline of Saint George Island (alongside the Potomac River).

In FY 2024, SHA is planning to place 345.7 acres under Forest Conservation easements statewide in the form of off-site retention of existing SHA-owned parcels with forested areas. SHA will receive a total of 172.9 acres of credit under the Maryland Forest Conservation Act.

SHA has identified opportunities to increase resiliency, including design funding for a project on MD 468 that aims to mitigate the coastal flood impacts occurring in this location through placement of a structure. SHA is also looking into initiating a study for a section of MD 16 to address drainage and condition concerns exacerbated by climate hazards.



MAA received a Resilient Maryland Grant from the Maryland Energy Administration for a microgrid feasibility study. The study will review considerations for renewable energy generation at the airport, battery storage, and adding infrastructure to support additional electric vehicles and electric ground support equipment. The results of this study will be incorporated into an overall decarbonization plan and audit that will include a GHG emissions inventory, a decarbonization strategy, and conceptual designs for projects to reduce GHG emissions at both airports. This effort is made possible by a \$1.2 million grant awarded under the Federal Aviation Administration's (FAA) Airports Climate Challenge.

## MD. Environment Code Ann. §2-1305 (2021)

The agencies shall report annually on the status of programs that support the State's greenhouse gas reduction efforts or address climate change.

The report required shall include:

- (i) Program descriptions and objectives;
- (ii) Implementation milestones, whether or not they have been met;
- (iii) Enhancement opportunities;
- (iv) Funding;
- (v) Challenges;
- (vi) Estimated greenhouse gas emissions reductions, by program, for the prior calendar year; and
- (vii) Any other information that the agency considers relevant.

The 2015 Maryland Commission on Climate Change (MCCC) Act required the MCCC and its participating agencies, including Maryland Department of Transportation (MDOT), to maintain a comprehensive action plan with 5-year benchmarks to achieve science-based reductions in Maryland's Greenhouse Gas (GHG) emissions. This 2023 status report meets the requirements of the MCCC Act (§2-1305) by sharing MDOT's progress towards achieving emission reduction targets and highlights recent and planned actions to continue to mitigate the impacts of climate change and reduce transportation sector GHG emissions.



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